| Ref<br><br>Section/Table<br><br>Page | From | To | Comment |
|---|---|---|---|
| D.5.301<br><br>Section: 5.6.1.3.2<br><br>Page: 5-55 | The mated cable assembly meets the DDNEXT requirement if its DDENXT does not exceed the limit shown in Figure 5-24; the vertices that defines the DDNEXT limit are: | The mated cable assembly meets the DDNEXT requirement if its DDNEXT does not exceed the limit shown in Figure 5-24; the vertices that defines the DDNEXT limit are: | typo |
| | | | |
| D.6.301<br><br>Section 6.9.2<br><br>Page 6-34 | A successful handshake is declared for link partner 1 if the following conditions are met within "tNoLFPSResponseTimeout" after t10 (see Figure 6-21 and Table 6-22):<br>1. Valid LFPS is received from link partner 2. | A successful handshake is declared for link partner 1 if the following conditions are met within "tNoLFPSResponseTimeout" after t10 (see Figure 6-21 and Table 6-22):<br>1. Valid LFPS is received from link partner 2.<br>Note: in case of concurrent U1 exit, where both ports initiate U1 exit simultaneously, both ports will assume to be Link partner 1. Both ports will start receiving LFPS signal before t10. And received U1 LFPS exit signal may be validated around t10. This may result in a minimum duration of U1 exit LFPS signal. To ensure a successful U1 exit under such situations, both ports, shall transmit U1 LFPS exit signal for 600ns, before exiting U1. | Clarification for concurrent U1 exit |

| | | | |
|---|---|---|---|
| D.6.302<br><br>Table 6-21<br><br>Page 6-33 | <table><tr><td></td><td>Min</td><td>Typ</td><td>Max</td></tr><tr><td>U1 Exit</td><td>300 ns</td><td></td><td>900 ns/2 ms</td></tr></table><br>Notes:<br>1. If the transmission of an LFPS signal does not meet the specification, the receiver behavior is undefined.<br>2. Only Ping.LFPS has a requirement for minimum number of LFPS cycles.<br>3. The declaration of Ping.LFPS depends on only the Ping.LFPS burst.<br>4. Warm Reset, U1/U2/Loopback Exit, and U3 Wakeup are all single burst LFPS signals. tRepeat is not applicable.<br>5. The minimum duration of an LFPS burst must be transmitted as specified. The LFPS handshake process and timing are defined in Section 6.9.2.<br>6. If both ports are in U1, tBurst Max is 900 ns; if one port is in U1 and the port is in U2, tBurst Max is 2 ms.<br>7. A Port in U2 or U3 is not required to keep its transmitter DC common mode voltage. When a port begins U2 exit or U3 wakeup, it may start sending LFPS signal while establishing its transmitter DC common mode voltage. To make sure its link partner receives a proper LFPS signal, a minimum of 80 µs tBurst must be transmitted. The same consideration also applies to a port receiving LFPS U2 exit or U3 wakeup signal. | <table><tr><td></td><td>Min</td><td>Typ</td><td>Max</td></tr><tr><td>U1 Exit</td><td>600 ns[7]</td><td></td><td>2 ms</td></tr></table><br>Notes:<br>1. If the transmission of an LFPS signal does not meet the specification, the receiver behavior is undefined.<br>2. Only Ping.LFPS has a requirement for minimum number of LFPS cycles.<br>3. The declaration of Ping.LFPS depends on only the Ping.LFPS burst.<br>4. Warm Reset, U1/U2/Loopback Exit, and U3 Wakeup are all single burst LFPS signals. tRepeat is not applicable.<br>5. The minimum duration of an LFPS burst must be transmitted as specified. The LFPS handshake process and timing are defined in Section 6.9.2.<br>6. A Port in U2 or U3 is not required to keep its transmitter DC common mode voltage. When a port begins U2 exit or U3 wakeup, it may start sending LFPS signal while establishing its transmitter DC common mode voltage. To make sure its link partner receives a proper LFPS signal, a minimum of 80 µs tBurst must be transmitted. The same consideration also applies to a port receiving LFPS U2 exit or U3 wakeup signal.<br>7. A port is still required to detect U1 LFPS exit signal at a minimum of 300ns. The extra 300ns is provided as the guard band for successful U1 LFPS exit handshake. | clarification |

D.6.303

Table 6-20

Page 6-35

| | U1 Exit | |
|---|---|---|
| | **Min** | **Max** |
| t11-t10 | 0.3 us | 0.9us |
| t13-t10 | | |
| t12-t11 | 0 | 0.9us |
| t13-t11 | 0.6us | 0.8us |
| t12-t10 | | |
| tNoLFPS Response Timeout | | 0.9us/2 ms[1] |

Note:
1. If both link partners are in U1, tNoLFPSResponseTimeout

| | U1 Exit | |
|---|---|---|
| | **Min** | **Max** |
| t11-t10 | 0.3 us | 0.9 us/(2ms[1]-900ns) |
| t13-t10 | 0.9 us | 2ms |
| t12-t11 | 0.3 us | 0.9 us[1] |
| t13-t11 | 0.6 us | 0.9 us[1] |
| t12-t10 | 0.6 us | 2ms[1] |
| tNoLFPS Response Timeout | | 2 ms |

Note:

1. There are two sets of maximum timing requirements. The set with short timing requirement applies to normal operations when U2_Inactivity_Timer is disabled. The set with relaxed timing requirement applies to operations when U2_Inactivity_Timer is enabled, It also includes one corner case where U2_Inactivity_Timer is disabled and the port, upon entry to U1, initiating U1 exit immediately.
2. In a case where U2_Inactivity_Timer is enabled, it is the responsibility of each link partner to respond accordingly depending on its U1 or U2 state. For example, when link partner 1 initiates exit in U1 and link partner 2 is in U2, it is expected that both link partners will eventually enter U0 with respective timings starting from different U1/U2 states. Essentially, t12-t10 of link partner 1 follows U1 Exit tBurst timing and t13-t11 of link partner 2 follows U2 Exit tBurst timing.

Filling in missing values in the table

Added 2ms in t11-t10 for consistency with table 6-21 in D.6.302.

Revised 1.7us to 2.0003ms for consistency with table 6-21. 2.0003ms is the sum of 2ms (from table 6-21 in D.6.302 and 300ns guard-band).

Revised 0.8us in t13-t11 for consistency with table 6-21 in D.6.302.

Revised .9us to 2ms for consistency with table 6-21 in D.6.302.

| | | | |
|---|---|---|---|
| D.6.304<br><br>Figure 6-21 | | t10 – when Link Partner 1 starts to transmit LFPS, in initiating exit from either U1/U2/U3/Loopback.<br><br>t11 – when Link Partner 2 validates the received LFPS for the required t11-t10 duration, and starts to transmit LFPS in response.<br><br>t12 – when Link Partner 1 validates the received LFPS of the required t12-t11 and t12-t10 durations, and starts to transmit SS signaling.<br><br>t13 – when Link Partner 2 transmits LFPS of meeting the required t13-t11 duration, and starts to transmit SS signaling. | Added missing definition of t10, t11, t12, and t13. |
| D.6.305<br><br>Section 6.9.2<br><br>Page: 6-35 | A successful handshake is declared for link partner 2 if the following conditions are met within tNoLFPSResponseTimeout after t11:<br><br>1. Link partner 2 has transmitted the minimum LFPS defined as (t13 – t11) in Table 6-22.<br><br>2. For U1 exit, U2 exit, U3 Wakeup, and not Loopback exit, link partner 2 is ready to transmit the training sequences and the maximum time gap after an LFPS transmitter stops transmission and before a SuperSpeed transmitter starts transmission is 20 ns. | A successful handshake is declared for link partner 2 if the following conditions are met:<br><br>1. Link partner 2 has transmitted the minimum LFPS defined as (t13 – t11) in Table 6-22.<br><br>2. For U1 exit, U2 exit, U3 Wakeup, and not Loopback exit, link partner 2 is ready to transmit the training sequences and the maximum time gap after an LFPS transmitter stops transmission and before a SuperSpeed transmitter starts transmission is 20 ns. | |

| | | | |
|---|---|---|---|
| 6.306<br><br>Section 6.9.3<br><br>Page: 6-35 | A Warm Reset is a reset generated only by a downstream port to an upstream port. A downstream port may issue a Warm Reset at any Link states except SS.Disabled. An upstream port is required to detect a Warm Reset at any link states except SS.Disabled. | A Warm Reset is a reset generated only by a downstream port to an upstream port. A downstream port may issue a Warm Reset at any Link states except SS.Disabled. An upstream port is required to detect a Warm Reset at any link states except SS.Disabled.<br><br>Note: Warm Reset is defined to be able to reset a hardware failure of a device, such as the LTSSM hanging. Under this assumption, Warm Reset may be detected in any link states except SS.Disabled. | |
| 6.306<br><br>Section 6.10.1<br><br>Page: 6-37 | All signal and power pins must withstand 2000 V of ESD using the human body model and 500 V using the charged device model without damage (Class 2 per JEDEC JESE22-A114-A). This ESD protection mechanism also helps protect the powered down Receiver from potential common mode transients during certain possible reset or surprise insertion situations. | All signal and power pins must withstand 2000 V of ESD using the human body model (CLASS 2 per JEDEC JESD22-A114F) and 500 V using the charged device model (CLASS III per JEDEC JESD22-C101D) without damage. | |
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| D.7.301<br><br>Section 7.5.9.2<br><br>Page: 7-53 | The port shall remain in U3 when the 10-ms LFPS handshake timer times out (tU3LFPSHandshakeTimeout) and a successful LFPS handshake meeting the U3 wakeup handshake signaling described in Section 6.9.2 is not achieved.The port may initiate U3 wakeup again after a minimum of 100-ms delay. | The port shall remain in U3 when the 10-ms LFPS handshake timer times out (tNoLFPSResponseTimeout) and a successful LFPS handshake meeting the U3 wakeup handshake signaling described in Section 6.9.2 is not achieved. 100-ms (tU3WakeupRetryDelay) after an unsuccessful LFPS handshake and the requirement to exit U3 still exists, then the port shall initiate the U3 wakeup LFPS Handshake signaling to wake up the host. | The way this is written, the "may" makes the retry sound optional, but it's required if a device wants to wake up the host. The only condition where a device would not do a retry, would be if the device decided it didn't need to wake up the host after a LFPS handshake failure. The bottom line is that for a device to work properly with the xHCI (and software managed resume) the retry is a requirement. |
| D.7.302<br><br>Section 7.5.6.2<br><br>Page: 7-54 | • A downstream port shall enable a 1-ms timer (tU0RecoveryTimeout) to measure the time interval between two consecutive link commands. This timer will be reset and restarted every time a link command is received.<br>• A downstream port and an upstream port shall enable a 10-µs timer (tU0LTimeout). This timer shall be reset when the first symbol of any link command or packet is sent and restarted after the last symbol of any link command or packet is sent. This timer shall be active when the link is in logical idle. | • The port shall enable a 1-ms timer (tU0RecoveryTimeout) to measure the time interval between two consecutive link commands. This timer will be reset and restarted every time a link command is received.<br>• The port shall enable a 10-µs timer (tU0LTimeout). This timer shall be reset when the first symbol of any link command or packet is sent and restarted after the last symbol of any link command or packet is sent. This timer shall be active when the link is in logical idle. | |

| | | | |
|---|---|---|---|
| D.7.303<br><br>Section: 7.5.6.2<br><br>Page: 7-55 | Note: After entry to U0 and the successful completion of training and link initialization, both ports are required to exchange port capabilities information using Port Capability LMPs within tPortConfiguration time as defined in Section 8.4.5. This includes the following scenarios: This includes the following scenarios. | Note: After entry to U0 and the successful completion of training and link initialization, both ports are required to exchange port capabilities information using Port Capability LMPs within tPortConfiguration time as defined in Section 8.4.5. This includes the following scenarios: | "This includes the following scenarios." Is repeated twice |
| | | | |
| | | | |
| D.8.302<br><br>Section 8.10.2<br><br>Page 8-32 | However, if the host receives a short packet and the host has another transfer to initiate with the same endpoint, then the host may instead send an ACK TP with the NumP field set to a non-zero value. | However, if the host receives a short packet with EOB = 0 and the host has another transfer to initiate with the same endpoint, then the host may instead send an ACK TP with the NumP field set to a non-zero value. | Ensuring that EOB=0 makes certain that the device doesn't want to flow control |

| | | | |
|---|---|---|---|
| D.8.303<br><br>Section 8.5.6.5.1 &<br><br>Section 4.4.7 | Section 8.5.6.5.1 Optional Normative LTM and BELT Requirements says:<br>• LTM TPs apply to all endpoint types except for isochronous endpoints.<br><br>Section 4.4.7, Interrupt Transfers, says:<br>• If the endpoint responds with a not ready notification or an acknowledgement indicating that it cannot accept any more packets, the host will not attempt another transfer to that endpoint until it receives a ready notification. The host must then service the endpoint within twice the service interval after receipt of the notification. | Modify section 8.5.6.5.1 Optional Normative LTM and BELT Requirements as follows:<br>• LTM TPs apply to all endpoint types except for isochronous endpoints. For interrupt endpoints the BELT value only applies while the endpoint is in a flow control condition.<br><br>Modify section 4.4.7, Interrupt Transfers, as follows:<br>• If the endpoint responds with a not ready notification or an acknowledgement indicating that it cannot accept any more packets, the host will not attempt another transfer to that endpoint until it receives a ready notification. The host must then service the endpoint within the larger of (a) twice the service interval, and (b) the device's last reported BELT, after receipt of the ready notification. | As it stands the 1.0 spec has two conflicting statements wrt to LTM statements |
| D.8.304<br><br>Section 8.5.6.5.1<br><br>Page 8-23 | A device shall send an LTM TP with a value of tBELTdefault in the BELT field in response to any change in state of LTM Enable within tMinLTMStateChange. | A device shall send an LTM TP with a value of tBELTdefault in the BELT field in response to any change in state of LTM_Enable within the timing specified by tMinLTMStateChange. | Clarification – purely grammatical |

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| D.8.305<br><br>Section 8.1<br><br>Page 8-2 | An NRDY Transaction Packet (TP) response indicates that an endpoint is not ready to sink or source data. Consequently, the host may continue to perform transactions with the endpoint on the device even before the endpoint notifies the host that it is ready. | An NRDY Transaction Packet (TP) response indicates that an endpoint is not ready to sink or source data. This allows the links between the device and the host to be placed in a reduced power state until an endpoint is ready to receive or send data. However, as mentioned in Section 8.10.1, the host may continue to perform transactions with the endpoint on the device even before the endpoint notifies the host that it is ready. | The change introduced was confusing and needed to be changed. |
| D.8.306<br><br>Section 8.12.2.1<br><br>Page 8-83 | Status reporting is always in the device-to-host direction. Table 8-29 summarizes the type of responses required for each. All Control transfers return status in the TP that is returned to the host in response to a STATUS TP transaction. | Status reporting is always in the device-to-host direction. Table 8-29 summarizes the type of responses required for each. All Control transfers return status in the TP that is returned to the host in response to a STATUS TP transaction.<br><br>Note that even though the status reporting is always in the device-to-host direction, the STATUS TP shall be treated as an OUT transaction. A host may start performing IN transactions to another endpoint without waiting for the response for the STATUS TP. | Clarification that the STATUS TP is an “OUT” transaction. |
| D.8.3.07<br><br>Figure 8-14<br><br>Page 8-18 | See the “To” Section | Add the “PP” bit to the STATUS TP | Allows a host to indicate whether it has any more data to send |

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| D.8.308<br><br>Section 8.4.2<br><br>Page 8-6 | The Set Link Function LMP shall be used to configure functionality that can be changed without leaving the active (U0) state.<br><br>Upon receipt of a LMP with the Force_LinkPM_Accept bit asserted, the port shall accept all LGO_U1 and LGO_U2 Link Commands until the port receives a LMP with the Force_LinkPM_Accept bit de-asserted. | The Set Link Function LMP shall be used to configure functionality that can be changed without leaving the active (U0) state.<br><br>Upon receipt of an LMP with the Force_LinkPM_Accept bit asserted, the port shall accept all LGO_U1 and LGO_U2 Link Commands until the port receives an LMP with the Force_LinkPM_Accept bit de-asserted. After the port receives an LMP with the Force_LinkPM_Accept bit de-asserted, the port will function in normal mode doing power management based on packet pending state of device's endpoints. | Clarification that the device must return to normal operation once it receives an LMP with the Force_LinkPM_Accept bit de-asserted. |

<table>
<tr>
<td>D.8.309<br><br>Table 8-3<br><br>Page 8-6</td>
<td>The change applied to this table is wrong. Please see too column as to which table the change should apply to.</td>
<td>Need to apply to Table 8-17.<br><br>Notification Type. This field identifies the type of the device notification.<br><br>
<table>
<tr><td>Value</td><td>Type of Device Notification TP</td></tr>
<tr><td>0000b</td><td>Reserved</td></tr>
<tr><td>0001b</td><td>FUNCTION_WAKE</td></tr>
<tr><td>0010b</td><td>LATENCY_TOLERANCE_MESSAGE</td></tr>
<tr><td>0011b</td><td>BUS_INTERVAL_ADJUSTMENT_MESSAGE</td></tr>
<tr><td>0100b</td><td>HOST_ROLE_REQUEST[1]</td></tr>
<tr><td>0101b-1111b</td><td>Reserved</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>D.8.310<br><br>Section: 8.12.5<br><br>Page: 8-91</td>
<td>If a device implements an inactivity timer for deciding when to drive the link into a lower power state, the device may choose to not reset the inactivity timer upon receiving an isochronous timestamps.</td>
<td>Remove the sentence in the from column</td>
<td></td>
</tr>
<tr>
<td>D.8.311<br><br>Table: 8-33<br><br>Page: 8-105</td>
<td>tNRDYResponse</td>
<td>tNRDYorSTALLResponse</td>
<td>Name changed</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| D.9.301<br><br>Section: 9.1.2<br><br>Page: 9-8 | When a device is attached to or removed from the USB, the host uses a process known as bus enumeration to identify and manage the device state changes necessary. When a device is attached to a powered port, the following actions are taken (note, these actions apply whether the attached device is a peripheral device or hub device: | When a device is attached to or removed from the USB, the host uses a process known as bus enumeration to identify and manage the device state changes necessary. When a device is attached to a powered port, the following actions are taken (note, these actions apply whether the attached device is a peripheral device or hub device): | Missing “)”[1] |
| | | | |
| D.10.301<br><br>Table 10-3<br><br>Page 10-63 | In the bHubHdDecLat row<br><br>The following are permissible values:<br>Value Meaning<br>00H Much less than 0.1 µs.<br>01H 0.1 µs<br>02H 0.2 µs<br>03H 0.3 µs<br>04H 0.4 µs<br>05H-<br>FFH Reserved | The following are permissible values:<br>Value Meaning<br>00H Much less than 0.1 µs.<br>01H 0.1 µs<br>02H 0.2 µs<br>03H 0.3 µs<br>04H 0.4 µs<br>05H 0.5 µs<br>06H 0.6 µs<br>07H 0.7 µs<br>08H 0.8 µs<br>09H 0.9 µs<br>0AH 1.0 µs<br>0BH-<br>FFH Reserved | With 32 bit PIPE interface support, it is not possible to meet the 0.4 µs decode delay. |

[1]

| | | | |
|---|---|---|---|
| D.10.302<br><br>Section 10.13.1<br><br>Page 10-60 | Change the values reported in the SuperSpeed USB Device Capability descriptor as defined in the "To" column | <table><tr><td>wSpeedsSupported</td><td>14</td></tr><tr><td>bFunctionalitySupport</td><td>1</td></tr></table> | A hub works at all speeds and it performs all the functions of a hub, just at progressively higher speeds. |
| D. 10.303<br><br>Table 10-15<br><br>Page: 10-81 | Change the tPropagationDelayJitterLimit max value | Max: 32ns from current value of 16 ns (changed from 8ns by the previous errata). | If there are SKPs to be sent out and if the ITP happens to arrive at the same time, hub as per the spec sends out SKPs and then sends the ITP.<br><br>This behavior though as per the spec, causes the hub to violate above timing.<br><br>We need to add 3 SKP pair (12ns) to the timing parameter. |
| D.10.304<br><br>Section 10.14.2.6.2<br><br>Page: 10-76 | This bit is set to one when the PORT_CONNECTION bit changes because the hub port downstream port successfully completed training and transitioned to the DSPORT.Enabled state.<br>This bit shall be set to zero by a ClearPortFeature(C_PORT_CONNECTION) request. | This bit is set to one when the PORT_CONNECTION bit changes because the hub port downstream port successfully completed training and transitioned to the DSPORT.Enabled state.<br>This bit shall be set to zero by a ClearPortFeature(C_PORT_CONNECTION) request or while logical port power is off. | A condition of "or while logical port power is off" is also necessary as a condition of clearing the bit. |

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| D.10.305<br><br>Section 10.14.2.6.2<br><br>Page: 10-76 | This bit is set to one when the PORT_OVER_CURRENT bit changes from zero to one or from one to zero. This bit is also set if the port is placed in the DSPORT.Powered-off state due to an overcurrent condition on another port. This bit shall be set to zero by a ClearPortFeature(C_PORT_OVER_CURRENT) request or while logical port power is off and when the port is in the DSPORT.Powered-off state. | This bit is set to one when the PORT_OVER_CURRENT bit changes from zero to one or from one to zero. This bit is also set if the port is placed in the DSPORT.Powered-off state due to an overcurrent condition on another port. This bit shall be set to zero by a ClearPortFeature(C_PORT_OVER_CURRENT) request. | The condition of "or while logical port power is off and when the port is in the DSPORT.Powered-off state" should be removed. If this condition exists C_PORT_OVER_CURRENT will be cleared immediately after over current detection because the hub DSPort state machine will transition to the DSPORT.Powered-off state when the hub detects the over current. |

<table>
<tr>
<td>D.10.306<br><br>Table 10-13<br><br>Page: 10-79</td>
<td>Table 10-13. U2 Timeout Value Encoding<br>Value Description<br>00H Zero (Default)<br>01H 256 µs<br>02H 512 µs<br>03H 768 µs<br>… …<br>FEH 65.024 ms<br>FFH Infinite<br>Note: Software shall not enable the U2 timeout for a downstream port that is connected to a hub.<br>Inconsistent link states could result if the timeout is enabled.</td>
<td>Table 10-13. U2 Timeout Value Encoding<br>Value Description<br>00H Zero (Default)<br>01H 256 µs<br>02H 512 µs<br>03H 768 µs<br>… …<br>FEH 65.024 ms<br>FFH Infinite<br>Note: It is the responsibility of software to properly set the U2 timeout for a downstream port that is connected to a hub.<br>Inconsistent link states could result if the timeout is not properly.<br>In general, the rule of thumb that software should follow is to set the upstream U2 timeout to at least twice the value of the U2 timeout of the downstream ports on the hub.</td>
<td></td>
</tr>
<tr>
<td>D.10.307<br><br>Section 10.13.1<br><br>Page: 10-60</td>
<td>SuperSpeed USB Device Capability<br><br>
<table>
<tr><td>bLength</td><td>10</td></tr>
<tr><td>bDescriptorType</td><td>DEVICE CAPABILITY Descriptor Type</td></tr>
<tr><td>…</td><td>…</td></tr>
<tr><td>wU2DevExitLat</td><td>Implementation-dependent</td></tr>
<tr><td>wReserved</td><td>0</td></tr>
</table>
</td>
<td>SuperSpeed USB Device Capability<br><br>
<table>
<tr><td>bLength</td><td>10</td></tr>
<tr><td>bDescriptorType</td><td>DEVICE CAPABILITY Descriptor Type</td></tr>
<tr><td>…</td><td>…</td></tr>
<tr><td>wU2DevExitLat</td><td>Implementation-dependent</td></tr>
</table>
</td>
<td>wReserved not required as the length is 10 and not 12.<br><br>This erratum was present in the last errata but didn’t get applied.</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| D.10.308<br><br>Section 10.7.8.4<br><br>Page: 10-42 | If the header packet is an ITP:<br><br>1. The header packet is queued for transmission on each downstream port with a link in U0<br><br>2. If the downstream port Tx header packet buffer queue is not empty (there is at least one header packet in the queue that has not been completely transmitted) or no link credit is available for transmission on the downstream port, the header packet is marked delayed and the correct Link Control Word CRC-5 is re-calculated for modified header packet. | If the header packet is an ITP:<br><br>1. The header packet is queued for transmission on each downstream port with a link in U0<br><br>2. If the downstream port Tx header packet buffer queue is not empty (there is at least one header packet in the queue that has not been completely transmitted) or no link credit is available for transmission on the downstream port or the delay introduced will exceed tPropagationDelayJitterLimit, the header packet shall be marked delayed and the correct Link Control Word CRC-5 is re-calculated for modified header packet. | Place an absolute time after which the ITP must be marked as delayed. |
| D.10.309<br><br>Section 10.6.2.1<br><br>Page: 10-32 | Under U1_ENABLE = 1, U2_ENABLE = 1<br><br>• The port's link shall initiate a transition to U1 if all the hub downstream ports are in U1 or a lower link state.<br>• The PM timer may be disabled and the PM timer values shall be ignored. | Under U1_ENABLE = 1, U2_ENABLE = 1<br><br>• The port's link shall initiate a transition to U1 if all the hub downstream ports are in U1 or a lower link state unless the conditions for U2 entry are satisfied.<br>• The port's link shall initiate a transition to U2 if all the hub downstream ports are in U2 or a lower link state. Note that if the port is already in U1 then the port shall transition to U0 before transitioning to U2.<br>• The PM timer may be disabled and the PM timer values shall be ignored. | |

| | | | |
|---|---|---|---|
| D.10.310<br><br>Section 10.6.2.1<br><br>Page: 10-32 | Under U1_ENABLE = 1, U2_ENABLE = 1<br><br>• The port's link shall accept U1 or U2 entry requests by its link partner unless the hub has one or more packets/link commands to transmit on the port.<br>o A U1 entry request shall not be accepted if one or more of the hub downstream ports has a link in U0 or recovery.<br>o A U2 entry request shall not be accepted if one or more of the hub downstream ports has a link in U1 or recovery. | Under U1_ENABLE = 1, U2_ENABLE = 1<br><br>• The port's link shall accept U1 or U2 entry requests by its link partner unless the hub has one or more packets/link commands to transmit on the port.<br>o A U1 entry request shall not be accepted if one or more of the hub downstream ports has a link in U0 or recovery.<br>o A U2 entry request shall not be accepted if one or more of the hub downstream ports has a link in U0, U1 or recovery. | |
| D.10.311<br><br>Table 10-14<br><br>Page: 10-80 | Conn_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to a connect event on this port; connect events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_CONNECTION port status change.<br><br>1 The hub is enabled to signal a remote wakeup due to a connect event on the port. | Conn_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to a connect event on this port; connect events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_CONNECTION port status change.<br><br>1 The hub is enabled to signal a remote wakeup due to a connect event on the port and if Function Remote Wake is also enabled. | |

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| D.10.312<br><br>Table 10-14<br><br>Page: 10-80 | Disconn_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to a disconnect event on this port; disconnect events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_CONNECTION port status change.<br><br>1 The hub is enabled to signal a remote wakeup due to a disconnect event on the port. | Disconn_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to a disconnect event on this port; disconnect events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_CONNECTION port status change.<br><br>1 The hub is enabled to signal a remote wakeup due to a disconnect event on the port and if Function Remote Wake is also enabled. | |
| D.10.313<br><br>Table 10-14<br><br>Page: 10-80 | OC_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to an overcurrent event on this port; over-current events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_OVER_CURRENT port status change. Note that a hub that does not support per-port over current detection/reporting will signal remote-wakeup for an over-current event unless all ports have OC-RWEnable set to 0.<br><br>1 The hub is enabled to signal a remote wakeup due to an over-current event on the port. | OC_RWEnable<br><br>0 The hub is disabled from signaling a remote wakeup due to an overcurrent event on this port; over-current events that occur during suspend must still be detected and reported after the resume process has completed (due to some other event) as a C_PORT_OVER_CURRENT port status change. Note that a hub that does not support per-port over current detection/reporting will signal remote-wakeup for an over-current event unless all ports have OC-RWEnable set to 0.<br><br>1 The hub is enabled to signal a remote wakeup due to an over-current event on the port and if Function Remote Wake is also enabled. | |

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| D.10.314<br><br>Section 10.8<br><br>Page: 10-50 | When a hub downstream port link is in the U3 state, the following requirements apply to the hub if it receives wakeup signaling from its link partner on that downstream port:<br><br>• If the hub upstream port's link is not in U3, the hub shall drive remote wakeup signaling on the downstream link where the wakeup signaling was received in tHubDriveRemoteWakeDownstream.<br><br>• If the hub upstream port's link is in U3, the hub shall drive wakeup signaling on its upstream port in tHubPropRemoteWakeUpstream. | When a hub downstream port link is in the U3 state, the following requirements apply to the hub if it receives wakeup signaling from its link partner on that downstream port:<br><br>• If the hub upstream port's link is not in U3, the hub shall drive remote wakeup signaling on the downstream link where the wakeup signaling was received in tHubDriveRemoteWakeDownstream.<br><br>• If the hub upstream port's link is in U3, the hub shall drive wakeup signaling on its upstream port in tHubPropRemoteWakeUpstream.<br><br>• If the hub upstream port is in the progress of entering U3, the hub shall wait until the U3 entry is completed, before driving wakeup signaling on its upstream port in tHubPropRemoteWakeUpstream.<br><br>When a hub upstream port's link enters the U3 state and one of its downstream links is in U0/U1/U2/Recovery and has received a remote wake , the hub shall automatically drive remote wakeup on upstream port in tHubPropRemoteWakeUpstream. | |
| D.10.315<br><br>Section 10.13.1<br><br>Page: 10-65 | bInterval value in the Endpoint descriptor | Needs to be set to 8 and not 16. | 16 is too long (amounts to about 4 secs) and could lead to an 8 sec gap before a change is noticed by the system. |

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| D.10.316<br><br>Section 10.8<br><br>Page: 10-50 | When a hub upstream port's link is in the U3 state and it receives wakeup signaling from its link partner on the hub upstream port's link, the hub shall automatically drive remote wakeup to any downstream ports that are in U3 and have received remote wakeup signaling since entering U3. | When a hub upstream port's link is in the U3 state and it receives wakeup signaling from its link partner on the hub upstream port's link, the hub shall automatically drive remote wakeup to any downstream ports that are in U3 and have received remote wakeup signaling since entering U3.<br><br>If the hub upstream port's link is in U3, the hub shall drive wakeup signaling on its upstream port due to connect (when the downstream port enters DSPORT.Enabled), disconnect, or overcurrent events, if the hub is enabled for remote wakeup. | |
| D.10.317<br><br>Section: 10.14.2.6.2<br><br>Page: 10-80 | This bit is set to one when the PORT_CONNECTION bit changes because the hub port downstream port successfully completed training and transitioned to the DSPORT.Enabled state. | This bit is set to one when the PORT_CONNECTION bit changes. | |
| D.10.318<br><br>Section: 10.14.2.6.2<br><br>Page: 10-80 | This bit is set to one when the port's link completes a transition from the U3 state to the U0 state as a result of a SetPortFeature(Port_Link_State) request or completes a transition from any of the U-states to SS.Inactive or Loopback state. This bit is not set to one due to transitions from U3 to U0 as a result of remote wakeup signaling received on a downstream facing port. | This bit is set to one when the port's link completes a transition from the U3 state to the U0 state as a result of a SetPortFeature(Port_Link_State) request or completes a transition from any of the U-states to SS.Inactive (with Rx terminations present) or Loopback state or Compliance state. This bit is not set to one due to transitions from U3 to U0 as a result of remote wakeup signaling received on a downstream facing port. | |

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| D.10.319<br><br>Section: 10.3.1.6<br><br>Page: 10-16 | From any state except for DSPORT.Powered-off or DSPORT.Disabled or DSPORT.Disconnected if the hub detects a Reset on its Upstream Port. In this situation the port shall initiate a Hot/Warm Reset on the downstream port link depending on the type of Reset detected on the hub's upstream port and depending on the current state of the downstream port. | From any state except for DSPORT.Powered-off-reset or DSPORT.Powered-off-detect or DSPORT.Powered-off or DSPORT.Disabled or DSPORT.Disconnected if the hub detects a Reset on its Upstream Port. In this situation the port shall initiate a Hot/Warm Reset on the downstream port link depending on the type of Reset detected on the hub's upstream port and depending on the current state of the downstream port. This transition shall occur before the upstream port link transitions to U0. | |
| D.10.320<br><br>Section: 10.3.1.2<br><br>Page: 10-16 | This is the default state when local power is valid (self-powered) or VBUS becomes valid (bus-powered. | This is the default state when local power is valid (self-powered) or VBUS becomes valid (bus-powered). | typo |
| D.10.321<br><br>Section: 10.3.1.2<br><br>Page: 10-16 | From the DSPORT.Disabled state when a SetPortFeature(PORT_LINK_STATE) Rx.Detext | From the DSPORT.Disabled state when a SetPortFeature(PORT_LINK_STATE) Rx.Detect | typo |
| D.10.322<br><br>Section: 10.12<br><br>Page: 10-62 | This allows the interface to function when local power is not available (refer to Section 7.2.1.2) | This allows the interface to function when local power is not available (refer to Section 11.4.1.1) | Incorrect section reference |

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| D.10.323<br><br>Section: 10.7.3<br><br>Page: | When a hub originates or forwards packets, Data packet headers and data packet payloads shall be sent contiguously at all times as required in Section 7.1.1.2.3. | When a hub originates or forwards packets, Data packet headers and data packet payloads shall be sent contiguously at all times as required in Section 7.2.1. | Incorrect section reference |
| D.10.324<br><br>Section: 10.2.3<br><br>Page: 10-11 | The hub shall evaluate the link power state of its downstream ports such that it propagates the highest link state of any of its downstream ports to its upstream port when there is no pending upstream traffic. U0 is the highest link state, followed by U1, then U2, then U3, then Rx.Detect, and then SS.Disabled. If an upstream port link state transition would result in an upstream port link state that has been disabled by software, the hub shall transition the upstream port link to the next highest U-state that is enabled. The hub never automatically attempts to transition the hub upstream port to U3. | The hub shall evaluate the link power state of its downstream ports such that it propagates the highest link state of any of its downstream ports to its upstream port when there is no pending upstream traffic. U0 is the highest link state, followed by U1, then U2, then U3, then Rx.Detect, and then SS.Disabled. The order of the other link states is undefined and implementation dependent. If an upstream port link state transition would result in an upstream port link state that has been disabled by software, the hub shall transition the upstream port link to the next highest U-state that is enabled. The hub never automatically attempts to transition the hub upstream port to U3 or lower state. | |
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| D.C.301<br><br>Section: C.1.5.2.4<br><br>Page: C-14 | The tMEL3 delay is the time for the PING_RESPONSE to traverse the | The tMEL4 delay is the time for the PING_RESPONSE to traverse the | |

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| D.C.302<br><br>Section: C.1.5.2.4<br><br>Page: C-14 | jitter". tMEL3 is calculated as: | jitter". tMEL4 is calculated as: | Line 6 of same section as above |
| D.C.303<br><br>Section: 1.5.2.2<br><br>Page: | tMEL2 = ((40 ns. + wHubDelay) * number of hubs) + 40 ns. | tMEL2 = (sum of wHubDelay values) + (40 ns * (number of hubs + 1)) | wHubDelay may be different for each hub. |

**New Sections**

### 4.4.8.4 Special Considerations for Isochronous Transfers

For a general overview of isochronous data movements over USB, USB clock model, clock synchronization, and the different types of USB-defined synchronization types and their specific requirements, refer to the USB 2.0 Specification, section 5.12. The following section presents the information necessary to implement SuperSpeed isochronous endpoints that need an explicit feedback isochronous endpoint.

#### 4.4.8.4.1 Explicit Feedback

A SuperSpeed asynchronous isochronous sink endpoint must provide explicit feedback to the host by indicating accurately what its desired data rate ($F_f$) is, relative to the USB bus interval frequency. This allows the host to continuously adjust the number of samples sent to the sink so that neither underflow nor overflow of the data buffer occurs. Likewise, a SuperSpeed adaptive source endpoint must receive explicit feedback from the host so that it can accurately generate the number of samples required by the host. Feedback endpoints can be specified as described in Section 9.6.6 for the *bmAttributes* field of the endpoint descriptor.

To generate the desired data rate $F_f$, the device must measure its actual sampling rate $F_s$, referenced to the USB notion of time, i.e., the USB bus interval frequency. This specification requires the data rate $F_f$ to be resolved to better than one sample per second (1Hz) in

order to allow a high-quality source rate to be created and to tolerate delays and errors in the feedback loop. To achieve this accuracy, the measurement time $T_{meas}$ must be at least 1 second. Therefore:

$$T_{meas} = 2^K$$

where $T_{meas}$ is now expressed in USB bus intervals and $K \geq 13$ for SuperSpeed devices (125 µs bus intervals). However, in most devices, the actual sampling rate $F_s$ is derived from a master clock $F_m$ through a binary divider. Therefore:

$$F_m = F_s * 2^P$$

where $P$ is a positive integer (including 0 if no higher-frequency master clock is available). The measurement time $T_{meas}$ can now be decreased by measuring $F_m$ instead of $F_s$ and:

$$T_{meas} = \frac{2^K}{2^P} = 2^{(K-P)}$$

In this way, a new estimate for $F_f$ becomes available every $2^{(K-P)}$ bus intervals. $P$ is practically bound to be in the range [0,K] because there is no point in using a clock slower than $F_s$ ($P$=0), and no point in trying to update $F_f$ more than once per bus interval ($P$=K). A sink can determine $F_f$ by counting cycles of the master clock $F_m$ for a period of $2^{(K-P)}$ bus intervals. The counter is read into $F_f$ and reset every $2^{(K-P)}$ bus intervals. As long as no clock cycles are skipped, the count will be accurate over the long term.

Each bus interval, an adaptive source adds $F_f$ to any remaining fractional sample count from the previous bus interval, sources the number of samples in the integer part of the sum, and retains the fractional sample count for the next bus interval. The source can look at the behavior of $F_f$ over many bus intervals to determine an even more accurate rate, if it needs to.

$F_f$ is expressed in number of samples per bus interval. The $F_f$ value consists of an integer part that represents the (integer) number of samples per bus interval and a fractional part that represents the "fraction" of a sample that would be needed to match the sampling frequency $F_s$ to a resolution of 1 Hz or better. The fractional part requires at least K bits to represent the "fraction" of a sample to a resolution of 1 Hz or better. The integer part must have enough bits to represent the maximum number of samples that can ever occur in a single bus interval. Assuming that the minimum sample size is one byte, then this number is currently limited to 48*1024=49152 and 16 bits are needed.

For SuperSpeed endpoints, the $F_f$ value shall be encoded in an unsigned 32.K ($K \geq 13$) format, encoded into eight bytes (for future extensibility). The value shall be aligned into these eight bytes so that the binary point is located between the fourth and the fifth byte so that it has a 32.32 format. Only the first K bits behind the binary point are required. The lower 32-K bits may be optionally used to extend the precision of $F_f$, otherwise, they shall be reported as zero.

An endpoint needs to implement only the number of bits that it effectively requires for its maximum $F_f$.

The choice of $P$ is endpoint-specific. Use the following guidelines when choosing $P$:

- $P$ must be in the range [0,K].
- Larger values of $P$ are preferred, because they reduce the size of the frame counter and increase the rate at which $F_f$ is updated. More frequent updates result in a tighter control of the source data rate, which reduces the buffer space required to handle $F_f$ changes.
- $P$ should be less than $K$ so that $F_f$ is averaged across at least two frames in order to reduce SOF jitter effects.
- $P$ should not be zero in order to keep the deviation in the number of samples sourced to less than 1 in the event of a lost $F_f$ value.

Isochronous transfers are used to read $F_f$ from the feedback register. The desired reporting rate for the feedback should be $2^{(K-P)}$ bus intervals. $F_f$ will be reported at most once per update period. There is nothing to be gained by reporting the same $F_f$ value more than once per update period. The endpoint may choose to report $F_f$ only if the updated value has changed from the previous $F_f$ value. If the value has not changed, the endpoint may report the current $F_f$ value or a zero length data payload. It is strongly recommended that an endpoint always report the current $F_f$ value any time it is polled.

It is possible that the source will deliver one too many or one too few samples over a long period due to errors or accumulated inaccuracies in measuring $F_f$. The sink must have sufficient buffer capability to accommodate this. When the sink recognizes this condition, it should adjust the reported $F_f$ value to correct it. This may also be necessary to compensate for relative clock drifts. The implementation of this correction process is endpoint-specific and is not specified.

**Change to LTSSM State Machine**:

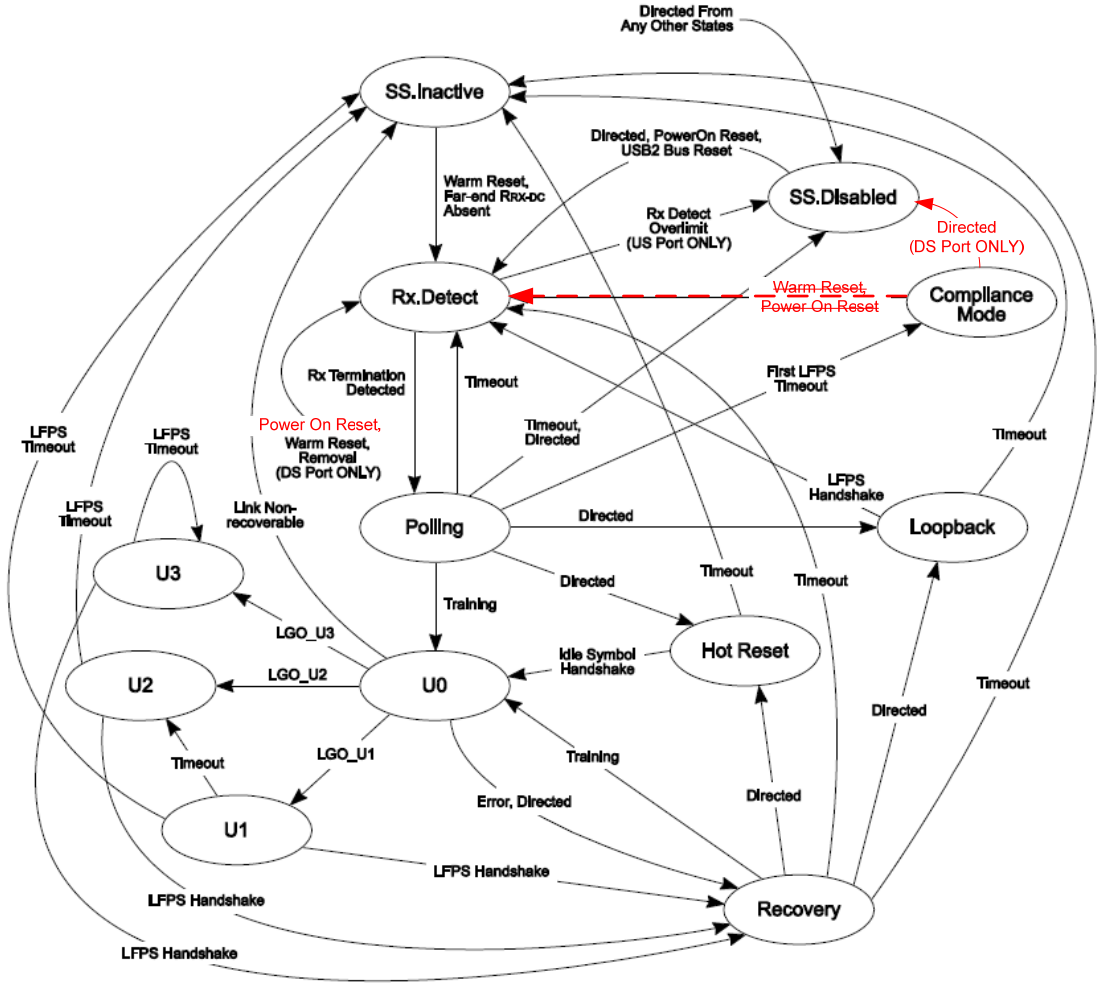
The LTSSM State Machine in Figure 7-13 defines a "Warm Reset, Power On Reset" transition between **Compliance Mode** and **Rx.Detect**. But section 7.5.5.2 of the USB3 spec "Exit from Compliance Mode" says that the Compliance Mode state is exited by a downstream port **only** if it is directed by software to do a Warm Reset or to disable the port. Nowhere in the section is "Power On Reset" mentioned, and the Compliance Mode to SS.Disabled transition is not shown in Fig 7-13.

Also, per section 7.5.3, it doesn't matter what state you are in, a "Power On Reset" will always transition a port to the Rx.Detect state.

1) The first sentence in section 7.5.3 says, "Rx.Detect is the power on state of the LTSSM for both a downstream port and an upstream port" so the "Power On Reset" condition should be added to the global "Warm Reset, Removal (DS Port ONLY)" transition into Rx.Detect in Fig 7-13 making it consistent with the section 7.5.3 text.
2) The Compliance Mode to Rx.Detect transition can be dropped because it is covered by the "Power On Reset" and "Warm Reset" conditions, of the global transition into Rx.Detect.
3) And a Compliance Mode to SS.Disabled "Directed (DS Port ONLY)" transition should be added, to make Fig 7-13 consistent with the text in section 7.5.5.2.

See the updated Figure 7-13 below.

**Figure 7-13. State Diagram of the Link Training and Status State Machine**




Note: Transition conditions are illustrative only. Not all of the transition conditions are listed.

U-047 [i]

[i] Need to remove the arc from Compliance mode to SS.Disabled.